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**ABSTRACT**

A multi-gun FIB system for nanofabrication provides increased throughput at reduced cost while maintaining resolution. Multiple guns are maintained in modular gun chambers that can be vacuum isolated from the primary vacuum chamber containing the targets. A system can include multiple gun chambers, each of which can include multiple guns, with each gun chamber being capable of being vacuum isolated, so that each gun chamber can be removed and replaced without disturbing the vacuum in other gun chambers or in the main chamber.

An optical column is associated with each gun. Optical elements for multiple columns can be formed in a bar that extends into several columns. Some of the optical elements are positioned in the gun chambers and others are positioned in the primary vacuum chamber. A through-the-lens/secondary particle collection can be used in connection with each of the individual columns.

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